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## **CLAIMS**

1. A method for determining an operating parameter of a chip having first and second ring oscillators, comprising:

measuring a frequency of the first ring oscillator;
measuring a frequency of the second ring oscillator; and
calculating an operating parameter of the chip as a function of the first and
second ring oscillator frequencies.

2. The method of claim 1 wherein the measuring of the first ring oscillator frequency comprises:

obtaining two ring oscillator clock counts, separated by a time difference, from a ring oscillator;

obtaining two independent clock counts, separated by the time difference, from a clock output independent from the ring oscillator; and

calculating a ratio of the difference between the two ring oscillator clock values and the difference between the two independent clock values.

- 3. The method of claim 2 wherein the calculated operating parameter comprises temperature.
- 4. The method of claim 2 wherein the calculated operating parameter comprises process speed.
  - 5. The method of claim 3, further comprising:

multiplying the measured frequency of the first ring oscillator by the measured frequency of the second ring oscillator to obtain a result; and

determining, as a function of the result and characterization data of the chip, the chip's operating temperature.

6. The method of claim 4, further comprising:

dividing the measured frequency of the first ring oscillator frequency by the measured frequency of the second ring oscillator to obtain a result; and

determining, as a function of the result and characterization data of the chip, the chip's process speed.

7. The method of claim 6, further comprising:

multiplying the measured frequency of the first ring oscillator by the measured frequency of the second ring oscillator to obtain a second result;

determining, as a function of the second result and the characterization data, the chip's operating temperature; and

adjusting the determined process speed according to the determined operating temperature.

8. The method of claim 3, further comprising:

calculating a scaled frequency value from the first and second measured ring oscillator frequencies and characterization data of the chip;

comparing the calculated scaled frequency value with a known range of scaled frequency values relative to temperature; and

determining, from the comparison, the temperature of the chip.

9. The method of claim 4, further comprising:

calculating a scaled frequency value from the first and second measured ring oscillator frequencies and characterization data of the chip;

comparing the calculated scaled frequency value with a known range of scaled frequency numbers relative to process speed; and

determining, from the comparison, the process speed of the chip.

10. Computer-readable media embodying a program of instructions executable by a computer to perform a method of determining an operating parameter of a chip having first and second ring oscillators, the method comprising:

measuring a frequency of the first ring oscillator;
measuring a frequency of the second ring oscillator; and
calculating an operating parameter of the chip as a function of the first and
second ring oscillator frequencies.

11. The computer-readable media of claim 10 wherein the measuring of the first ring oscillator frequency comprises:

obtaining two ring oscillator clock counts, separated by a time difference, from a ring oscillator;

obtaining two independent clock counts, separated by the time difference, from a clock output independent of the ring oscillator; and

calculating a ratio of the difference between the two ring oscillator clock values and the difference between the two independent clock values.

- 12. The computer-readable media of claim 11 wherein the calculated parameter comprises temperature.
- 13. The computer-readable media of claim 11 wherein the calculated parameter comprises process speed.
- 14. The computer-readable media of claim 12 wherein the method further comprises:

multiplying the measured frequency of the first ring oscillator by the measured frequency of the second ring oscillator to obtain a result; and

determining, as a function of the result and characterization data of the chip, the chip's operating temperature.

15. The computer-readable media of claim 13 wherein the method further comprises:

dividing the measured frequency of the first ring oscillator frequency by the measured frequency of the second ring oscillator to obtain a result; and

determining, as a function of the result and characterization data of the chip, the chip's process speed.

16. The computer-readable media of claim 15, wherein the method further comprises:

multiplying the measured frequency of the first ring oscillator by the measured frequency of the second ring oscillator to obtain a second result;

determining, as a function of the second result and the characterization data, the chip's operating temperature; and

adjusting the determined process speed according to the determined operating temperature.

17. The computer-readable media of claim 12 wherein the method further comprises:

calculating a scaled frequency value from the first and second measured ring oscillator frequencies and characterization data of the chip;

comparing the calculated scaled frequency value with a known range of scaled frequency values relative to temperature; and

determining, from the comparison, the temperature of the chip.

18. The computer-readable media of claim 13 wherein the method further comprises:

calculating a scaled frequency value from the first and second measured ring oscillator frequencies and characterization data of the chip;

comparing the calculated scaled frequency value with a known range of scaled frequency numbers relative to process speed; and

determining, from the comparison, the process speed of the chip.

## 19. A system comprising:

a chip having first and second ring oscillators; and

a processor configured to:

measure a frequency of the first ring oscillator;
measure a frequency of the second ring oscillator; and
calculate an operating parameter of the chip as a function of the first
and second ring oscillator frequencies.

- 20. The system of claim 19 wherein the chip comprises the processor.
- 21. The system of claim 19 wherein the processor is separate from but operably connected to the chip.
- 22. The system of claim 19 wherein the chip additionally comprises:
  a first counter configured to obtain two ring oscillator clock counts, separated by a time difference, from the first ring oscillator;

a second counter configured to obtain two independent clock counts, separated by the time difference, from a clock output independent of the first and second ring oscillators; and

wherein the processor is further configured to calculate a ratio of the difference between the two ring oscillator clock values and the difference between the two independent clock values.

- 23. The system of claim 22 wherein the calculated parameter comprises temperature.
- 24. The system of claim 22 wherein the calculated parameter comprises process speed.
- 25. The system of claim 23 wherein the processor is additionally configured to: multiply the measured frequency of the first ring oscillator by the measured frequency of the second ring oscillator to obtain a result; and

determine, as a function of the result and characterization data of the chip, the chip's operating temperature.



- 26. The system of claim 24 wherein the processor is additionally configured to:
  divide the measured frequency of the first ring oscillator frequency by the
  measured frequency of the second ring oscillator to obtain a result; and
  determine, as a function of the result and characterization data of the chip,
  the chip's process speed.
- 27. The system of claim 26, wherein the processor is further configured to:
  multiply the measured frequency of the first ring oscillator by the measured
  frequency of the second ring oscillator to obtain a second result;

determine, as a function of the second result and the characterization data, the chip's operating temperature; and

adjust the determined process speed according to the determined operating temperature.

28. The system of claim 23 wherein the processor is further configured to:
calculate a scaled frequency value from the first and second measured ring
oscillator frequencies and characterization data of the chip;

compare the calculated scaled frequency value with a known range of scaled frequency values relative to temperature; and

determine, from the comparison, the temperature of the chip.

29. The system of claim 24 wherein the processor is further configured to:
calculate a scaled frequency value from the first and second measured ring
oscillator frequencies and characterization data of the chip;

compare the calculated scaled frequency value with a known range of scaled frequency numbers relative to process speed; and

determine, from the comparison, the process speed of the chip.

30. An processor comprising:
 means for measuring a frequency of a first ring oscillator;
 means for measuring a frequency of the second ring oscillator; and

means for calculating an operating parameter of a chip as a function of the first and second ring oscillator frequencies.

- 31. The apparatus of claim 30 wherein the calculated parameter comprises temperature.
- 32. The apparatus of claim 30 wherein the calculated parameter comprises process speed.